



## APPENDIX I RADIO FREQUENCY EXPOSURE

### LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

### EUT Specification

<b>EUT</b>	Wireless-N Boardband Home Router
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input type="checkbox"/> Others
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure ( $S = 5\text{mW}/\text{cm}^2$ ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure ( $S=1\text{mW}/\text{cm}^2$ )
<b>Antenna diversity</b>	<input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input checked="" type="checkbox"/> Tx/Rx diversity
<b>Max. output power</b>	IEEE 802.11b mode: 16.54 dBm (45.08 mW) IEEE 802.11g mode: 24.01 dBm (251.77 mW) IEEE 802.11n HT 20 MHz mode: 26.67 dBm (464.52 mW) IEEE 802.11n HT 40 MHz mode: 26.48 dBm (444.63 mW)
<b>Antenna gain (Max)</b>	2.64 dBi (Numeric gain: 1.84) Antenna Calculation for MIMO Mode: $2.64\text{dBi} + 10 \log (2) = 5.65 \text{ dBi}$ (Numeric gain: 3.67)
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A

### **Remark:**

1. The maximum output power is 26.67dBm (464.52mW) at 2437MHz (with 3.67numeric antenna gain.)
2. DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.
3. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is  $1.0 \text{ mW}/\text{cm}^2$  even if the calculation indicates that the power density would be larger.

### TEST RESULTS

No non-compliance noted.

### MPE EVALUATION

No non-compliance noted.

**Calculation**

Given  $E = \frac{\sqrt{30 \times P \times G}}{d}$  &  $S = \frac{E^2}{3770}$

Where  $E =$  Field strength in Volts / meter

$P =$  Power in Watts

$G =$  Numeric antenna gain

$d =$  Distance in meters

$S =$  Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770d^2}$$

Changing to units of mW and cm, using:

$$P (mW) = P (W) / 1000 \text{ and}$$

$$d (cm) = d(m) / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where  $d =$  Distance in cm

$P =$  Power in mW

$G =$  Numeric antenna gain

$S =$  Power density in mW / cm<sup>2</sup>

**Maximum Permissible Exposure**

Substituting the MPE safe distance using  $d = 20$  cm into Equation 1:

Yields

$$S = 0.000199 \times P \times G$$

Where  $P =$  Power in mW

$G =$  Numeric antenna gain

$S =$  Power density in mW / cm<sup>2</sup>



**IEEE 802.11b mode:**

EUT output power = 45.08 mW

Numeric Antenna gain = 1.84

$\rightarrow$  Power density = 0.0165 mW / cm<sup>2</sup>

**IEEE 802.11g mode:**

EUT output power = 251.77 mW

Numeric Antenna gain = 1.84

$\rightarrow$  Power density = 0.09219 mW / cm<sup>2</sup>

**IEEE 802.11n HT 20 MHz mode:**

EUT output power = 464.52 mW

Numeric Antenna gain = 3.67

$\rightarrow$  Power density = 0.33933 mW / cm<sup>2</sup>

**IEEE 802.11n HT 40 MHz mode:**

EUT output power = 444.63 mW

Numeric Antenna gain = 3.67

$\rightarrow$  Power density = 0.32473 mW / cm<sup>2</sup>

*(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm<sup>2</sup> even if the calculation indicates that the power density would be larger.)*